ings that James Geikie's hereditary literary instincts were exhibited, for he published in 1887 a series of translations from the German, "Songs and Lyrics by Heinrich Heine, etc." His frank manner and *bonhomie* won him many friends, and we may well believe that, though an ardent golfer, like so many other Scotchmen, he gave expression to the sentiment ascribed to him that he found a still more pleasant means of recreation in "loafing in pleasant places with a congenial friend." J. W. J.

EMILE-HILAIRE AMAGAT.

BY the death of M. Emile-Hilaire Amagat at his country estate at Saint Satur in the department of Cher, France loses one of her most distinguished physicists. Born in 1840, he held several minor teaching appointments before becoming professor at the Ecole Normal at Cluny. Here in 1867 he commenced his researches into the behaviour of gases under high pressures, which rapidly brought him into the front rank as an experimentalist. At Lyons, where he had become professor at the Catholic university, he utilised the tower of one of the churches as the site for a mercury manometer giving pressures up to 80 atmospheres, and in one of the coal mines of Saint Etienne constructed one up to 430 atmospheres. His observations on nitrogen at these pressures enabled him to use the nitrogen manometer in his experiments on other gases, on liquids and solids, and on the conditions of transition from one state to the other. By the help of a skilled mechanic he had himself trained, he was able to construct apparatus for observations at pressures up to 3000 atmospheres. His results, which appeared for the most part in the *Annales de Chimie et de Physique,* were summarised in memoirs of dates 1883 and 1893, and his curves showing the variation of the value of pv as p increases for hydrogen, nitrogen, and carbonic acid have been reproduced in standard text-books for the last twenty years.

In 1892 Amagat was elected an honorary member of the Literary and Philosophical Society of Manchester, and in 1897 a foreign member of the Royal Society of London. After going to Paris as examiner for admission into the Ecole Polytechnique, he was in 1902 elected member of the Académie des Sciences. In 1906 he was president of the French Physical Society, and soon after was elected one of its few honorary members. Although offered a professorship at the Ecole Polytechnique, he preferred his examinership, and continued to devote to research much of the leisure it allowed him. During the last few years his health kept him at his country house, and for several months before his death he was confined to his room. For a generation he had been one to whom younger men could appeal for advice and encouragement in their work, and many distinguished physicists of to-day recall with affection his kindliness, his sincerity, and his modesty. C. H. L.

NOTES.

THE prospectus of British Dyes (Limited), which was put before the public a few days ago, has evoked universal condemnation in the daily Press. As might perhaps have been anticipated, the board of directors does not include a single representative of science, whilst the directors appointed by the Government consist of a railway director and a civil engineer. This characteristic neglect of science, and its consequences, form the subject of two letters by Sir William Ramsay and Sir Henry Roscoe, published in Wednesday's *Times*. Sir William Ramsay gives numerous instances to show that scientific chemists *must* form an important part of the directorate if the scheme is to be a success. The Castner Kellner process has on its board Sir Henry Roscoe and Dr. Beilby. The ammonia-soda process, originally patented by Dyer and Hemming, was successfully introduced and managed by the late Dr. Ludwig Mond. The paraffin industry was due to the late James Young, at one time an assistant of Prof. T. Graham. Perkin's and Spiller's names are associated with the early days of synthetic colours. These men were both pupils of Hofmann at the Royal College of Chemistry. The firm of Spencer, Chapman, and Messel, which has for many years manufactured sulphuric acid by the contact process, owes its inception and success to Dr. Messel. Turning to metallurgy, Lowthian Bell and Bessemer were scientific chemists first; successful manufacturers after. In short, it would be difficult to discover a successful chemical industry which has not been initiated and controlled by a chemist. Unless "British Dyes (Limited)" copies this precedent, there is little hope for it.

SIR HENRY ROSCOE, in the letter referred to above, points out that it is not the manufacture of the well-known colours of indigo, alizarin, or methyl blue which will bring financial and final success to British Dyes (Limited). The preparation of these articles—which, like all complicated chemical processes, requires both knowledge and great care—is on well-known lines. It is the new thing which makes a business success. "In the colour industry it is then the research chemist, and he alone, who can keep the flag flying, for he alone can bring forward new forces and create new developments. Capital cannot do it, business capacity cannot do it, but the brains, the imagination, the skill, and the knowledge of the research chemist can." Yet though this is the case, so far at least, the research chemist is to have no voice in the direction of affairs in the new colour company, but merely to be called in as an expert when, in the opinion of his business superiors, he can help them to solve some difficulty. If this plan is persisted in and the scientific chemist is not given a voice in the management "success is improbable, if not impossible."

THE Bakerian lecture of the Royal Society will be delivered on Thursday next, March 18, by Prof. W. H. Bragg, upon the subject of "X-rays and Crystals."

WE regret to see the announcement that Principal Sir James Donaldson, Vice-Chancellor of the University of St. Andrews, died on Tuesday night, March 9, at eighty-three years of age.

The death is announced, in his sixty-fifth year, of Prof. H. W. L. Tanner, F.R.S., formerly professor of mathematics and astronomy at University College, Cardiff.

We learn from the *Morning Post* that Jean Maspero, the son of Sir Gaston Maspero, the Egyptologist, was killed in the Argonne on February 18 while leading his section into action.

Prof. Samuel W. Shattuck, for forty-four years professor and comptroller of the University of Illinois, died at his home in Champaign on February 13. Since 1868, says *Science,* Prof. Shattuck served the University of Illinois. For thirty-seven years he was head of the department of mathematics and from 1873 to 1912 he looked after the business affairs of the University.

On Tuesday next, March 16, Sir J. G. Frazer will begin a course of two lectures at the Royal Institution on the belief in immortality among the Polynesians; and on Thursday, March 18, Dr. Aubrey Strahan will commence a course of two lectures on London geology. The Friday evening discourse on March 19 will be delivered by Prof. G. H. Bryan, on the modern piano-player—scientific aspects, and on March 26 by Sir J. J. Thomson on experiments in slow kathode rays.

We regret to announce the death on March 6, in his eighty-seventh year, of Lieut.-General J. F. Tennant, F.R.S., past-president of the Royal Astronomical Society. When a young man, Lieut.-General Tennant was assistant to the Trigonometrical Survey of India. He served as Government Astronomer of Madras in 1859, and was afterwards transferred to the Public Works Department as an executive engineer, first, in Burma, then in the Punjab, and later in Bengal. He made observations of the solar eclipses of 1867–68 and 1871, and was in charge of those of the transit of Venus at Rurki and Lahore in 1876.

The death is announced of Mr. Flaxman C. J. Spurrell, aged seventy-two. For many years he was interested in the geology of the Thames valley and co-operated with his father, the late Dr. Flaxman Spurrell, in collecting Pleistocene mammalia from the river-deposits at Crayford, Kent. In 1880 he described to the Geological Society his discovery at Crayford of a Palæolithic land-surface showing evidence of flint-implements in process of manufacture. The whole of the collection, both of mammalian remains and of flints, was presented to the British Museum (Natural History) in 1893 and 1895.

The death is announced, at fifty-eight years of age, of Mr. William Willett, the promoter of the Daylight Saving Bill. The Bill proposed that clocks and other timepieces in Great Britain and Ireland should be put on an hour on the third Sunday in April of every year and put back again on the third Sunday in September. Mr. Willett was able to obtain support for this measure from many city corporations and town and district councils, in spite of the serious objections to it, but though the Bill was introduced into the House of Commons on two separate occasions it never reached the final stages. Mr. Willett was a fellow of the Royal Astronomical Society.

The council of the British Association, in consultation with the local executive committee at Manchester, has decided that the annual meeting of the association shall be held in that city as arranged, in September next. Both the committee and the council have felt that it would be inexpedient under present conditions to offer an elaborate local hospitality in the form of social and other arrangements, which has been extended to the association on former occasions. The committee, however, expressed its desire that the long continuity of the yearly meetings should not be broken, and stated that it would "prefer that the meeting should be held although restricted to its more purely scientific functions."

The War Office has just published the following table showing the distribution of the cases of typhoid which have occurred in the British Forces in the Field, between the categories of uninoculated, the fully inoculated, and the partially protected:—

	Cases	Deaths
Uninoculated	359	48
Fully inoculated within 2 years (two doses)	111	1
Partially protected (one dose) ...	136	1
Totals	606	50

Lord Kitchener, Secretary of State for War; Dr. A. Strahan, F.R.S., director of the Geological Survey of Great Britain; and Prof. P. Vinogradoff, Corpus professor of jurisprudence at Oxford, have been elected members of the Athenæum Club under the provisions of the rule which empowers the annual election by the committee of three persons "of distinguished eminence in science, literature, the arts, or for public services."

We learn that no fewer than thirty-seven members of the established staff of the Natural History Museum are at present serving with the naval or military forces, about half of them having joined their units at the front. Among these are Capt. E. E. Austen, who has for many years had charge of the Diptera in the museum; Lieut. C. Court Treatt, assistant in the bird-room, Mr. A. K. Totton, who was recently appointed to the invertebrate section of the department of zoology; Mr. H. F. Wernham, assistant in the department of botany; and Mr. W. N. Edwards, the newly appointed assistant for the study of fossil plants. In addition to the members of the established staff ten temporary assistants and forty-seven sons of the former class have joined the colours, while the museum has also furnished an efficient Red Cross Section and a platoon for the Volunteer Training Corps for Home Defence.

Some few years ago the buildings of the Aquarium at Rothesay, which was for a time one of the well-known "sights" of the Clyde, were taken over by the Marquis of Bute. The buildings have, through the generosity of the Marquis, provided a local habitation for the Buteshire Natural History Society, of which Dr. J. N. Marshall is president, while they have also served to house a valuable and developing museum collection illustrative of the local fauna and flora. Lord Bute has now installed a small laboratory for biological research and provided the most necessary equipment, including a motor-boat. Mr. L. P. W. Renouf, of Trinity College, Cambridge, has been placed in charge, and as he is desirous of making the laboratory a thoroughly convenient centre for research work upon the wonderfully rich marine fauna and flora of the Clyde estuary, he will be grateful for the gift of books and pamphlets bearing upon marine zoology and botany. Any such gifts should be forwarded to the Bute Museum, Rothesay, N.B.

THE death is announced, in his seventieth year, of Dr. C. E. Bessey, professor of botany since 1884 at the University of Nebraska. For fourteen years previously he had held a similar post at the Iowa Agricultural College. From 1880 to 1897 he was botanical editor of the *American Naturalist,* and since 1897 he had been botanical editor of *Science.* Prof. Bessey had at various times occupied the presidential chair of the American Association for the Advancement of Science, of the Botanical Society of America, of the Society for the Promotion of Agricultural Science, of the American Microscopical Society, and of the natural science department of the National Education Association. He was the author of "The Phylogeny and Taxonomy of Angiosperms," "Plant Migration Studies," and "Outlines of Plant Phyla," as well as of several botanical text-books for schools.

WE referred in NATURE of February 4 (p. 622) to reports from a number of correspondents that the battle in the North Sea on January 24 was accompanied by much disturbance among pheasants in Lincolnshire, Yorkshire, and even in Cumberland. The disturbance was most noticeable between 9.45 and 10.30 a.m., that is, as we know from Sir David Beattie's report, at the time when the *Blücher* received its principal injuries before sinking. In woods near Burgh-le-Marsh in Lincolnshire, the guns were heard simultaneously with the crowing of the pheasants. Canon Rawnsley, who has collected many reports on the subject, infers that "the pheasant's ear is capable of receiving impressions from sound-waves that the human ear cannot respond to" (*Times,* February 22); but, in a later issue (March 6), Dr. Davison suggests that the disturbance might be caused by the sudden swaying of low trees and undergrowth during the passages of the air-waves. He directs attention to the fact (see NATURE, vol. lxii., pp. 377-9) that, during a naval review at Cherbourg on July 18, 1900, the reports were heard for 107 miles, while windows for another thirty miles were shaken by the inaudible air-waves.

ON Tuesday evening, March 9, Mr. George E. Brown, the editor of the *British Journal of Photography,* at a meeting of the Royal Photographic Society, described a method of colour photography that has recently been worked out at the Eastman Kodak Company's research laboratory at Rochester, N.Y. It is a two-colour method, and as blue is suppressed or represented in only a modified way, the process is not claimed to be suitable for other work than portraiture. The many fine examples shown prove that it gives excellent results, and that the lighter tones, such as those of flesh tints, white kid gloves, pearls, and so on, are particularly well rendered. The darker colours, such as the browns, are very rich, but in the absence of the original materials photographed, it is not possible to say how nearly the colours are imitated. The process consists in taking two negatives, one through a red and one through a green screen, developing and fixing them, then dissolving away the silver image, and staining the films, the red record green, and the green record red. The dyed plates are placed face to face (one is taken reversed to permit of this) and constitute the portrait. It has to be viewed as a transparency, those shown being adjusted in colour for incandescent electric lamps behind a diffusing ground-glass screen or its equivalent. If preferred, the original negatives may be kept as such, and ordinary positives prepared from them. These positives may then be made to furnish any number of negatives for conversion into colour portraits. We learn that the process has already been taken up enthusiastically by American portrait photographers.

THE most interesting contribution to vol. vii., part 4, of the Journal of the Gypsy Lore Society is the first part of an account translated from the Arabic of Father Anastas, the Carmelite, describing the Nawar or Gypsies of the East. The description of them is the reverse of complimentary: "swindling rogues, lewd adventurers, wicked nomads, heedless ruffians," preserving a language of their own but destitute of any religion—the last statement interesting if it be correct. They are believed to be a mixture of Indians, Persians, Kurds, Turks, and Tartars, with the off-scourings of the regions in which they have lived. Their name, Nawar, is, it is suggested a corruption of Lūr, the Persian wanderers who are noted for their skill in thieving, sleight-of-hand, and powers of witch-craft, and they may possibly be ultimately traced to the Indian peninsula. The author writes from personal knowledge of them, and he gives full references to the literature of the subject.

ACCORDING to the *Museum Journal* for September, 1914, a fine piece of art metal-work from the celebrated Dictæan Cave in Crete has found its way to the Philadelphia Museum. It is a unique bronze blade with incised designs, to which the nearest parallel is supplied by the inlaid daggers from the shaft graves at Mycenæ, but these are more elaborate in design and more beautiful in technique. The blade is 6 in. in length and is covered with a fine green patina. It probably belongs to the Late Minoan III. period. On one side a hunter is attacking a mighty boar with a spear, the jungle being indicated by a tuft of fern-like sprays between the sportsman and his victim. On the other side is represented the critical moment of an exciting bull fight, one bull clearly getting the worst of the encounter. Similar fern-like sprays on the quarters of one animal possibly represent the furry lines of his coat where the direction of the hair changes. The museum has also acquired a fine series of reproductions of the gems of Minoan and Mycenæan art—several swords and daggers, gold and silver cups from Mycenæ and Vaphio, faïence objects from the shrine of the serpent goddess at Knossos, and reproductions of some of the frescoes, including the famous cup-bearer.

AMONG the articles in the February number of the *American Naturalist* is one by Messrs. Castle and Fish on the black-and-tan rabbit and the significance of multiple allelomorphs, in which the origin of the breed is indicated.

IN vol. x., No. 7, of the University of California publications on archæology and ethnology, Mr. P. E. Goddard has collected a number of tales and legends of the Chilula tribe, a group of Indians now nearly extinct. The collection is a strange complex of primitive types of belief: animal tales, witchcraft, demonology, folk-medicine, and incidents of social life. It is well that the opportunity has been taken to place on record the language and folk beliefs of a people which in a few years it will be impossible to recover.

A PHOTOGRAPH of the European bison cow and calf in the Zoological Gardens is one of the features in the February number of *Wild Life*. Although this calf is the first of its kind born in the London establishment, cow-bison have produced offspring on more than one occasion in the Duke of Bedford's park at Woburn. In connection with a photograph of Canadian wild geese, Mr. S. J. Wigley states that the omission of these birds from the list of species protected in Alberta is a testimony to their alertness and cunning.

THE report of the Indian Museum for 1913–14 deals largely with last year's celebration of the centenary of that institution, of which a notice has already been published in our columns, and the inauguration of a series of public lectures. Much of the rest relates to administrative details and other matters of purely local interest; and attention has also been directed in NATURE to the biological survey of the Chilka Lake, which is discussed in the report under the heading of field-work. Among noteworthy additions to the zoological collections were specimens from the Chilka Lake, specimens received from the marine survey, mammal-skins sent by the Bombay Natural History Society, and a series of, chiefly fresh-water invertebrate, specimens from Kashmir.

NEW reptiles and amphibians from the Permo-Trias of South Africa are described by Mr. S. H. Haughton in vol. xii., part 2, of the Annals of the South African Museum. Very striking is a fine stegocephalian skull referred to the European genus Trematosaurus, under the name of *T. sobeyi*. A skull allied to Tapinocephalus is made the type of a new genus and species, with the designation *Struthiocephalus whaitsi;* and of two new therocephalians, one is regarded as entitled to represent a new generic type (Trochosaurus). Three dicynodonts are also described as new, in one of which it is shown that the bone in Lystrosaurus hitherto regarded as the exoccipital, really represents both that element and the paroccipital (opisthotic).

THE Journal of the Washington Academy of Sciences for January 19 (No. 2, of vol. v.) contains an interesting paper by Mr. H. S. Graves on the place of forestry among natural sciences. The importance of the forest as a distinct plant society and its connection with botany, plant geography, meteorology, sociology, and engineering is well put forward. In the same number Mr. P. C. Standley describes a new genus of Chenopodiaceæ from Arizona, under the name of Zuckia, which is most closely related to Atriplex.

PROF. H. H. W. PEARSON publishes an account of his observations on the internal temperatures of *Euphorbia virosa* and *Aloe dichotoma* in the Annals of the Bolus Herbarium, vol. i., part ii., 1914. The plants grow on the dry slopes of the Great Karasberg. The stem structure of the Euphorbia is remarkable from the large air cavities in the stem. The Euphorbia attains its maximum external temperature more rapidly than the Aloe, and temperatures as high as 51·5° C. were recorded when the black-bulb registered 65·8° C. On wounding, the temperature of the Euphorbia falls suddenly, and the fall is attributed to the expansion of the pith gases due to the withdrawal of latex. When a rubber pellicle has been formed over the wound by the exuded latex the fall in temperature ceases. In Aloe the lowering of temperature on wounding appears to be due to surface evaporation and the recovery in this case is slow, since there is no protective formation of rubber over the wound.

IN *Knowledge* for January Mr. L. Claremont describes the methods of ruby-mining in Burma, with the aid of a number of photographs, and of illustrations by Burmese artists. He deals also with the red spinels, or "balas rubies," of which a large example, presented to the Black Prince, occurs among the crown jewels of Great Britain. The possible sedimentary origin of the ruby-bearing limestone in Burma has been lately pointed out by Mr. T. H. D. La Touche (see NATURE, vol. xciv., p. 348).

THE *Revue Scientifique,* which continues its fifty-third volume in Paris, publishes (February 6) a lecture given in 1914 by Prof. Stanislas Meunier on "Le problème des montagnes." The author repeats his suggestion that earthquakes may be caused by the explosion of steam, when water-bearing blocks of the earth's crust slip down into regions of high temperature. He declines, however, to look forward, with Termier, to catastrophic displacements of the surface. We may note that the *Revue* invites records of Frenchmen destined for scientific careers, who have fallen, in heroic circumstances, in the present conflict. Two such obituaries are published in the number here referred to.

THE Meteorological Office with its recent *Weekly Weather Report* has issued a summary of temperature, rainfall, and duration of bright sunshine for the past winter, as comprised in the period for the thirteen weeks from November 29, 1914, to February 27, 1915. The temperature for the winter was in excess of the average over the whole of England, the greatest difference occurring in the east and south-east and in the midland counties, where the mean was approximately 2° warmer than the normal. In Scotland there was a deficiency of nearly 1°, and in Ireland the defect for the winter was about 1·5°. The duration of bright sunshine was not very different from the normal, the amount being slightly deficient in the eastern districts, whilst there was a slight excess of sunshine in the western districts. Excessive rains were recorded over the whole of the United Kingdom, the fall being heaviest over England, where the rains for the whole country were 196 per cent. of the average. In Ireland the rainfall was 152 per cent. of the average, and in Scotland 131 per cent. The greatest excess of rain occurred in the south-east of England, where the measurement, 17·19 in., was 248 per cent. of the normal, whilst in the east of England the record was 228 per cent. of the normal, and in the midland counties 196 per cent. The rainy days were in excess of the average over the entire kingdom, the excess being generally greatest in the English districts.

Symons's Meteorological Magazine for February gives the rainfall for January last at representative stations over the United Kingdom. The total at Camden Square was 4·12 in., which is 2·29 in. more than the average, and is 225 per cent. of the normal. This is the highest percentage of the average at any station given in the table, which, however, is only a tentative representation. Naturally there are many stations given with a larger rainfall, but the normals at these were larger. The map giving the Thames Valley rainfall for January, which in such times of flood as the present is of special interest, shows an area in the neighbourhood of Marlborough with a fall of more than 6 in., and fairly large areas are given with more than 5 in. The rainfall of 4·12 in. at Camden Square is said to be the greatest in January in the fifty-eight years' record, with the exception of January, 1877, when 4·74 in. was measured. Combining the records at Camden Square for the three months November, 1914, to January, 1915, the total measurement is 13·98 in., which is 56 per cent. of the annual average fall, and is 224 per cent. of the normal for the period. The rainfall for January is said to have been above the average over practically the whole of the British Isles, the excess being greatest in the south of England. On the Pennines 8 in. or more fell generally. A copy of a photograph is given showing the flooding of Salisbury Cathedral on January 5 and 6. In the neighbourhood the rainfall measured 16·86 in. from October 13 to December 31, and of this 2·93 in. fell in the last seven days of December, whilst an additional 2·06 in. fell in the first three days of January. The current number commences the fiftieth volume of the magazine.

THERE is a general belief that the paintings of old masters owe their success in some measure to secret processes or lost arts. A paper on the scientific aspects of this question is contributed by Dr. Maximilian Toch to the Journal of the Franklin Institute for January. Among other conclusions, the author points out that the painters only used a limited number of colours (madder being one) the permanency of which was well established, and that they avoided mixing those which were known to undergo chemical combination in each others' presence. As examples of scientific methods of detecting later day copies, some interesting examples are given. The use of zinc white instead of flake white, the presence of protoplasmic remains in the wood cells, and the transparency of the bitumen in the shadows are particular proofs that a picture is not a genuine antique. As regards deterioration, the author alludes to the serious effect of smoke and modern gas fumes, and further points out that while either light or darkness may bleach a picture, some that have been kept in the dark may be restored by placing them in bright sunlight. Finally, Dr. Toch condemns the style of modern painting, which substitutes the collapsible tube or palette knife for the brush, on the ground that the flakes of colour thus attached to the canvas will crack off and become detached. If, therefore, this method was ever used three hundred years ago, no traces of it would now be in existence.

DR. W. C. SABINE publishes an account of a recent lecture to the Franklin Institute on architectural acoustics in the Journal of the institute for January. The investigations referred largely to the lecture hall of Harvard University, in which an ordinary spoken word remained audible for about 5½ seconds. At first they were applied to determine the absorption only of a note of the pitch of violin C, but they have now been extended for three octaves in either sense. By introducing more and more cushions into the room a curve was plotted connecting the quantity of absorbing material with the duration of the sound, and was proved to be very approximately a rectangular hyperbola. Another curve shows that the absorption increases with the pitch. An interesting feature is the diagram showing the distribution of sound intensity in a room with a barrel-shaped ceiling, and though the curves look remarkably complicated, the author finds that it is easy to observe the maxima and points of zero intensity. In conclusion the author says: "While these several factors, reverberation, interference, and echo in an auditorium at all complicated are themselves complicated, nevertheless they are capable of an exact solution, or, at least of a solution as accurate as are the architect's plans in actual construction. It is entirely possible to calculate in advance of construction whether or not an auditorium will be good, and, if not, to determine the factors contributing to its poor acoustics and a method for their correction." It is a pity that these results are not generally applied, so as to prevent public halls being built in such a way that echoes make them almost useless.

M. HENRY LE CHATELIER has contributed an article on explosives to *La Nature* of February 20. In the article the general phenomena of explosion and the methods of measuring the relative value of explosives are discussed, much space being devoted to the phenomena of gaseous explosions. The general questions of the heat developed on explosion, the influence of mechanical forces, of chemical stability, and other minor points are touched upon. In conclusion, it is pointed out that the manufacture and employment of explosives are very complex questions, and demand long study; that in time of war it is not wise to introduce new explosives or great variation in methods of manufacture. Inventors and the public are apt to look more particularly for the production of explosives of enormous power without giving consideration to other all-important factors governing their production and application.

Engineering for March 5 contains an illustrated description of Lord Chetwynd's electrical steel-purification process, which has been in use for the past eighteen months at the Grimesthorpe Works, Sheffield, belonging to Messrs. Cammell, Laird and Co., Ltd. The steel is manufactured in the ordinary way in the Siemens-Martin furnace, and is then teemed into a special ladle. When teeming steel into a ladle in the ordinary way, a portion of the slag is drawn out with it, and becomes so intermingled with the steel in the ladle that it has no time to separate completely and to rise to the surface before the pouring into the ingot moulds takes place. Lord Chetwynd's process is applied to the steel in the ladle. Two graphite electrodes are made to rest in the layer of slag covering the molten steel in the ladle, and iron electrodes are fitted in the bottom of the ladle. As soon as the graphite electrodes are lowered into the layer of slag an electric current is made to flow through the steel, the effect of which is to raise the temperature of the metal, causing a rotating action throughout the molten mass, with the result that it is freed from the gases and slag particles which it contained in teeming from the furnace. The process lasts about thirty minutes, and the current expenditure is small. Test results show that the process has a marked refining action upon the metal in the ladle.

OUR ASTRONOMICAL COLUMN.

Mellish's Comet.—A note in the *Times* of March 10 states that the orbit of this comet obtained by Andersen and Fischer, of Copenhagen, places perihelion passage at about 1 p.m. on July 25 next, the distance being 110 million miles. The comet will remain visible to English observers up to the middle of May, by which time it is likely to be faintly discernible with the naked eye. It now rises about half an hour after midnight, the best time for observation being 5 a.m., when it is a little east of south. Its positions at 5 a.m. on the dates named are as follows:—

	R.A.			Decl.	
	h.	m.	s.	°	′
March 12 ...	17	39	26 ...	0	51 N.
16 ...	17	44	16 ...	0	29
20 ...	17	49	5 ...	0	4
24 ...	17	53	50 ...	0	22 S.

The British Eclipse Expeditions of 1914.—The January number (vol. lxxv., No. 3) of the *Monthly Notices of the Royal Astronomical Society* contains the preliminary reports of the various British expeditions which were dispatched last year to observe the total eclipse of the sun on August 21. These reports have now been issued also in a separate pamphlet, and distributed by the secretary of the Joint Permanent Eclipse Committee. Brief accounts of the work of each of these expeditions have already been given in this journal, so attention need only be directed to the handy collective publication mentioned above.

Astronomy in America.—With a strong editorial board the National Academy of Sciences of the United States of America has begun a publication of monthly proceedings. These proceedings will be official, and are intended to serve as a medium for prompt publication of brief original papers. It is intended that the papers will be shorter and less detailed than those published in journals devoted to special branches of science, and that they shall, if possible, include an introductory statement of the general aspects of the research, and of its relation to previous knowledge in the same field, so that its significance may be appreciated by those engaged in other branches of science. In the first number (January 15, vol. i., No. 1) astronomy is well represented by the following communications:—The radial velocities of nebulæ, by W. W. Campbell; Preliminary note on nebular proper motions, by H. D. Curtis; Discovery of the ninth satellite of Jupiter, by S. B. Nicholson; Spherical aberration in astronomical objectives due to changes of temperature, by F. Schlesinger; The relations between the proper motions and the radial velocities of the stars of the spectral types F, G, K, and M, by J. C. Kapteyn and W. S. Adams; and, finally, a critique of the hypothesis of anomalous dispersion in certain solar phenomena, by C. E. St. John.

Grundspectra of Alkali and Alkaline Earth Metals.—A research interesting to spectroscopists is that communicated to the *Astrophysical Journal* for January (vol. xli., No. 1, p. 16), by Mr. Edgar H. Nelthorpe. The work was carried out in the astrophysical laboratory of the Imperial College of Science and Technology, and deals with the observations of the *grundspectra* of alkali and alkaline earth metals. The term *grundspectra* refers to spectra obtained by Goldstein, who used a method by which line spectra of some elements were obtained which were totally different from their arc spectra and could not be arranged in series of the ordinary type. As Goldstein's method appeared in some cases completely to isolate enhanced lines (spark) from the arc lines occurring under the ordinary arc or spark conditions, the author of the present paper has repeated and extended this research, embodying some of the spectra of elements which are represented in stellar spectra. The elements here dealt with are sodium, potassium, rubidium, calcium, strontium, and barium. Mr. Nelthorpe describes the apparatus he employed, and gives the results of each element separately, accompanying them with a series of excellent photographic comparison spectra. The chief conclusion drawn is that the *grundspectra* obtained by Goldstein's method consist essentially of lines which are specially developed in the ordinary spark spectrum. In the case of potassium and rubidium the spectra consist entirely of enhanced lines, but with the calcium group the arc spectrum is not entirely absent.

Electrons in the Sun's Atmosphere.—In a paper communicated to the Tokio Mathematico-physical Society in October, 1914, Prof. H. Nagaoka directs attention to the important part which may be played by calcium in the production of electrons in the sun's atmosphere. In the flocculi so abundant in the photosphere it exists probably as calcium oxide, and the electronic emission of lime when incandescent is frequently utilised in laboratory work. At the pressure of one-tenth of an atmosphere which prevails in the calcium layer about a sun-spot, the electrical conductivity will not be too great to allow of considerable potential gradients which, according to their direction, will establish outward or inward electronic currents of considerable magnitudes. If, as seems most likely, the electric field is directed inwards, the electronic emission will be outwards and the regions of emission will be surrounded by electronic vortices with counter-clockwise rotation. Within the vortices magnetic fields will be produced, and the whole region will possess the properties found to exist in sun-spots. Comparisons of some of the consequences of this theory with observations are, it is hoped, to be carried out by the author and his pupils.